Bihar Board Class 12 Maths Model Paper- Set 2

Solutions

Objective Answers

ANSWERS

1. (B)	**2.** (B)	**3.** (A)	**4.** (C)	**5.** (C)	**6.** (B)	**7.** (A)	**8.** (B)	**9.** (D)	**10.** (C)
11. (D)	**12.** (C)	**13.** (D)	**14.** (C)	**15.** (C)	**16.** (B)	**17.** (C)	**18.** (C)	**19.** (D)	**20.** (A)
21. (C)	**22.** (A)	**23.** (C)	**24.** (A)	**25.** (D)	**26.** (B)	**27.** (B)	**28.** (A)	**29.** (B)	**30.** (C)
31. (C)	**32.** (A)	**33.** (D)	**34.** (B)	**35.** (C)	**36.** (A)	**37.** (B)	**38.** (B)	**39.** (A)	**40.** (D)

Non-Objective Questions

ANSWERS

Let $\sin^{-1}\frac{4}{5}=\theta, \sin^{-1}\frac{5}{13}=\phi$ and $\sin^{-1}\frac{16}{65}=\psi$

$\therefore \quad \sin\theta=\frac{4}{5}$

$\sin\phi=\frac{5}{13}$

and $\sin\psi=\frac{16}{65}$

Hence $\cos\theta=\frac{3}{5}, \cos\phi=\frac{12}{13}$ and $\cos\psi=\frac{63}{65}$

1.

Now $\sin(\theta + \phi) = \sin\theta \cdot \cos\phi + \cos\theta \cdot \sin\phi$

$$= \frac{4}{5}\cdot\frac{12}{13} + \frac{3}{5}\cdot\frac{5}{13} = \frac{63}{65} = \cos\psi = \sin\left(\frac{\pi}{2} - \psi\right)$$

$\therefore \quad \theta + \phi = \frac{\pi}{2} - \psi$

$\therefore \quad \boxed{\theta + \phi + \psi = \frac{\pi}{2}}$

Hence the result

2. We have $A^2 = A \cdot A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix} = \begin{bmatrix} 1+0 & 0+0 \\ -1-7 & 0+49 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -8 & 49 \end{bmatrix}$

$$\therefore \quad A^2 - 8A = \begin{bmatrix} 1 & 0 \\ -8 & 49 \end{bmatrix} - 8\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -8 & 49 \end{bmatrix} + \begin{bmatrix} -8 & 0 \\ 8 & -56 \end{bmatrix}$$

$$= \begin{bmatrix} 1-8 & 0+0 \\ -8+8 & 49-56 \end{bmatrix}$$

$$= \begin{bmatrix} -7 & 0 \\ 0 & -7 \end{bmatrix} = -7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = -7I$$

Hence on comparison $R = -7$

3. Expanding along the first row, we get

$\Delta = \cos\alpha \cos\beta\ (\cos\beta \cos\alpha - 0) - \cos\alpha \sin\beta\ (-\sin\beta \cos\alpha) - \sin\alpha\ (-\sin\alpha \sin^2\beta - \sin\alpha \cos^2\beta)$

$= \cos^2\alpha \cos^2\beta + \cos^2\alpha \sin^2\beta + \sin^2\alpha \sin^2\beta + \sin^2\alpha \cos^2\beta$

$= \cos^2\alpha\ (\cos^2\beta + \sin^2\beta) + \sin^2\alpha\ (\sin^2\beta + \cos^2\beta)$

$= \cos^2\alpha \cdot 1 + \sin^2\alpha \cdot 1 = 1$

4. From the given equation

$$\tan^{-1}\frac{2\cos x}{1-\cos^2 x} = \tan^{-1}(2\cos x) \text{ where } \cos^2 x < 1$$

$\Rightarrow \quad \tan^{-1}\frac{2\cos x}{\sin^2 x} = \tan^{-1}(2\cos x)$

$\Rightarrow \quad \frac{2\cos x}{\sin^2 x} = 2\cos x$

$\Rightarrow \quad 2\cos x = 2\cos x \cdot \sin^2 x$

$\Rightarrow \quad 2\cos x\ [1 - \sin^2 x] = 0$

$\Rightarrow \quad \cos x \cdot \cos^2 x = 0$

$\Rightarrow \quad \cos^3 x = 0$

$\cos x = 0$

$\Rightarrow \quad \boxed{2n\pi \pm \frac{\pi}{2}}$

5. Differentiating both sides w.r.t. x, we get

$$x \cdot (-\sin y)\frac{dy}{dx} + \cos y \cdot 1 = \cos(x+y)\left[1 + \frac{dy}{dx}\right]$$

$$\Rightarrow \quad -x\sin y\frac{dy}{dx} + \cos y = \cos(x+y) + \cos(x+y)\cdot\frac{dy}{dx}$$

$$\Rightarrow \quad \frac{dy}{dx}\left[\cos(x+y) + x\sin y\right] = \cos y - \cos(x+y)$$

$$\boxed{\therefore \ \frac{dy}{dx} = \frac{\cos y - \cos(x+y)}{\cos(x+y) + x\sin y}}$$

6. Let $e^x = z$

$\therefore \quad e^x dx = dz$

$\therefore \quad I = \int e^x \cos(e^x)dx = \int \cos(e^x)e^x dx = \int \cos z dz = \sin z = \sin(e^x) + C$

7. We have

$$\therefore \quad \vec{a} \times \vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & -7 & 7 \\ 3 & -2 & 2 \end{vmatrix}$$

$$= \vec{i}(-14+14) - \vec{j}(2-21) + \vec{k}(-2+21)$$

$$= \vec{i}(0) - \vec{j}(-19) + \vec{k}(19)$$

$$= \boxed{19\vec{j} + 19\vec{k}}$$

$$\therefore \quad \left|\vec{a} \times \vec{b}\right| = \sqrt{0^2 + 19^2 + 19^2} = \sqrt{19^2 \times 2} = 19\sqrt{2}$$

8. Let A = Event of always 4 exhibits on second dice

= {(1,4), (2,4), (3,4), (4,4), (5,4), (6,4)}

$n(A) = 6$

and B = Event of the numbers appeared has a sum 8.

B = {(4,4)}

$\therefore \quad A \cap B = A \cap \{(4,4)\} = \{(4,4)\}$

$n(A \cap B) = 1$

$$\boxed{P\left(\frac{B}{A}\right) = \frac{P(A \cap B)}{n(A)} = \frac{1}{6}}$$

9. From the given equation, we have

$$\frac{dy}{dx}-\frac{2x}{1+x^2}y=x^2+2$$

Here $I.F.=_{e^-}\int\frac{2x}{1+x^2}dx=e^{-\log(1+x^2)}=e^{\log\left(1+x^2\right)^{-1}}=\frac{1}{1+x^2}$

Hence the solution is

$$y\cdot\frac{1}{1+x^2}=\int\left(x^2+2\right)\cdot\frac{1}{1+x^2}dx$$

$$=\int\frac{\left(x^2+1\right)+1}{1+x^2}dx$$

$$=\int\left\{1+\frac{1}{1+x^2}\right\}dx$$

$$=\int dx+\int\frac{1}{1+x^2}dx$$

$$=x+\tan^{-1}x+C$$

$\Rightarrow\quad y=(1+x^2)\,(x+\tan^{-1}x+c)$

10. Let $I=\int_0^{\frac{\pi}{2}}\log\sin x dx$ ...(i)

then $I=\int_0^{\frac{\pi}{2}}\log\sin\left(\frac{\pi}{2}-x\right)dx$

Since $\int_0^a f(x)dx=\int_0^a f(a-x)dx=\int_0^{\frac{\pi}{2}}\log\cos x dx$ ...(ii)

(i) + (ii)

$$2I=\int_0^{\frac{\pi}{2}}\left(\log\sin x+\log\cos x\right)dx=\int_0^{\frac{\pi}{2}}\log\left(\sin x\cos x\right)dx$$

$$=\int_0^{\frac{\pi}{2}}\log\frac{\sin 2x}{2}dx$$

$$=\int_0^{\frac{\pi}{2}}\left\{\log\sin 2x-\log 2\right\}dx$$

$$=\int_0^{\frac{\pi}{2}}\log\sin 2x dx-(\log 2)\int_0^{\frac{\pi}{2}}dx$$

$$=z,-\frac{\pi}{2}\log 2$$ ...(iii)

Now we evaluate,

$$I_1 = \int_0^{\frac{\pi}{2}} \log\sin 2x dx$$

For this, let $2x = t$ so that $2dx = dt$

Also $(x = 0 \Rightarrow t = 0)$ and $\left(x = \frac{\pi}{2} \Rightarrow t = \pi\right)$

$$\Rightarrow \quad I_1 = \int_0^{\pi} \log\sin t \cdot \frac{dt}{2} = \frac{1}{2}\int_0^{\pi} \log\sin t dt$$

Here $\log\sin\left(2\cdot\frac{\pi}{2} - t\right) = \log\sin t$

$$\therefore \quad I_1 = \frac{1}{2}\cdot 2\int_0^{\frac{\pi}{2}} \log\sin t dt$$

for if $f(2a - x) = f(x)$, then

$$\int_0^{2a} f(x)\,dx = 2\int_0^{a} f(x)\,dx$$

Hence $I_1 = \int_0^{\frac{\pi}{2}} \log\sin t dt = \int_0^{\frac{\pi}{2}} \log\sin x dx = I$

$\therefore$ From (i),

$$2I = I - \frac{\pi}{2}\log 2$$

$$\Rightarrow \quad I = -\frac{\pi}{2}\log 2$$

Hence the result.

11. माना कि $\frac{x-1}{k} = \frac{y-2}{2} = \frac{z-3}{3} = \lambda$ है, तो इस प्रकार के व्यापक बिन्दु के निर्देशांक $(1 + k\lambda, 2 + 2\lambda, 3 + 3\lambda)$ है। फिर यदि $\frac{x-2}{3} = \frac{y-3}{k} = \frac{z-1}{2} = \mu$ लें, तो इस पर के व्यापक बिन्दु के निर्देशांक $(2 + 3\mu, 3 + k\mu, 1 + 2\mu)$ है। यदि ये रेखाएँ छेदन करती हैं तो एक बिन्दु उभयनिष्ठ होगा तथा उस स्थिति में दोनों रेखा पर के व्यापक बिन्दु के निर्देशांक समान होगें।

i.e. $1 + k\lambda = 2 + 3\mu,\ 2 + 2\lambda = 3 + k\mu,\ 3 + 3\lambda = 1 + 2\mu$

$\Rightarrow \quad k\lambda - 3\mu - 1 = 0,\ 2\lambda - k\mu - 1 = 0,\ 3\lambda - 2\mu + 2 = 0$

प्रथम दो परिणाम से हम पाते हैं कि

$$\frac{\lambda}{3-k} = \frac{\mu}{-2+k} = \frac{1}{-k^2+6}$$

$$\Rightarrow \quad \lambda = \frac{3-k}{6-k^2};\mu = \frac{k-2}{6-k^2}$$

ये मान तीसरे परिणाम में रखने पर,

$$3\left(\frac{3-k}{6-k^2}\right)-2\left(\frac{k-2}{6-k^2}\right)+2=0$$

$\Rightarrow \quad 9 - 3k - 2k + 4 + 12 - 2k^2 = 0$

$\Rightarrow \quad 2k^2 + 5k - 25 = 0$

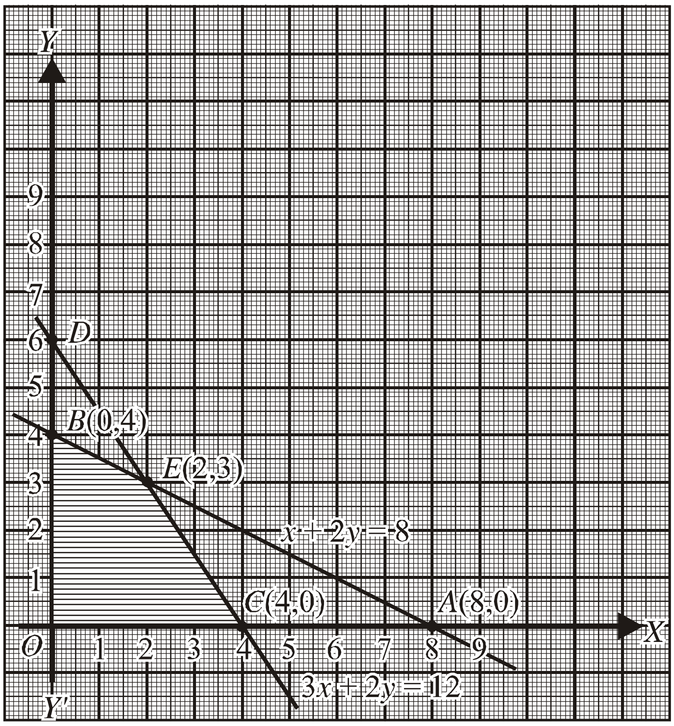
$\Rightarrow \quad 2k(k + 5) - 5(k + 5) = 0$

$\Rightarrow \quad (2k - 5)(k + 5) = 0$

$\Rightarrow \quad k = \frac{5}{2}, k = -5$

परंतु $\frac{5}{2}$ पूर्णांक नहीं है, इसलिए यहाँ $k = -5$(पूर्णांक)

12. First of all, let us graph the feasible region of the system of in equations.



The shaded region in the figure above is the feasible region determined by the given system of constraints.

We observe that the feasible region *OCES* is bounded. So we use corner point method to determine the minimum value of *z*.

The co-ordinates of the corner points O, C, E, B are (0,0), (4,0), (2,3) and (0,4) respectively. Now we evaluate $z = -3x + 4y$ at reach corner point.

Corner point	Corresponding value of $z = -3x + 4y$
(0,0)	0
(4,0)	–12 Min
(2,3)	6
(0,4)	8

Hence min. value of z is –12 at the point (–4,0).